

A NEW LILJEBORGHID AMPHIPOD (CRUSTACEA) FROM KERALA, INDIA

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The single ovigerous female (4.5 mm long) described herein was obtained while examining bottom samples taken during the summer months near the bar mouth of the Kayamkulam lake, a shallow stretch of back water on the west coast of Peninsular India, between latitudes 9°7' and 9°16' north and longitudes 76°20' and 76°28' east. The main body of the lake runs parallel to the sea from which it is separated by a sandy beach, one to three furlongs wide. The lake communicates with the sea through a narrow bar, except for about four months between January and May. The most noteworthy factor influencing the lake is the periodical changes in salinity, due to tidal influence. The annual variation in salinity may briefly be summarized thus: With the commencement of the dry season early in December, the salinity rises steadily, mainly as a result of tidal influence and partially due to the concentration of salts by evaporation, and continues increasing to about 35‰, in April-May. But with the onset of the south-west monsoon in June, rain water entering the lake through two streams and a commercial canal, the latter bringing in the flood water from the adjoining rivers, raises the water level in the lake by about two feet above the average summer level. Since, by early February the lake becomes cut off from the sea by a bar formed through sand accretion, the newly added flood water dilutes the lake water and thus brings about a marked drop in its salinity. Later, when the bar is cut open to let out the accumulated flood water into the sea, the strong flow flushes out the salinity of the lake completely within three or four days and the lake water thus becomes quite fresh in all its regions, except near the bar mouth where the water is very slightly brackish. This flow of lake water into the sea continues for about three weeks lowering the water level gradually. Simultaneously the tides creep in slowly so that by August-September, the salinity increases to about 15 to 20‰. The northeast monsoon sets in towards the end of September followed by a second flood of lesser intensity during which the salinity again falls for a short period. Since the lake is rather limited in extent, the influence of the tide or that of rain water is immediately felt throughout the lake and it shows an annual variation from 0-35‰.

The floor of the lake is formed of fine sand and silt and is devoid of any natural rock formations. During the summer the bottom supports dense patches of algae in the shallow regions. These weed clusters are favourable habitats for a variety of animals dominated by polychaetes and crustaceans, the amphipoda forming the principal crustacean component. *Listriella similis* sp. nov. is in all probability an inhabitant of such algal communities of the bar mouth where, as suggested earlier, some salinity is detectable even when other regions of the lake are truly fresh water in character. The holotype is deposited at the Marine Biology Laboratory, University of Kerala, Trivandrum-7, India.

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SYSTEMATICS

Suborder: GAMMARIDEA

Family: LILJEBORGIIDAE

Genus: *Listriella* J. L. Barnard*Listriella similis* sp. nov.*Female*

Body with diffuse pigmentation; cephalon slightly longer than first peraeon segment, anteriorly produced into a small, sharp rostrum, ocular lobes projecting, with irregularly truncate anterior margin, upper angle more pointed. Eyes large, roughly oval and reddish brown. Peraeon segments smooth, deep, the last two longer and deeper than preceding ones. First three segments of pleon subequal in length, depth gradually increasing, ventral margins convex, postero-lateral angle

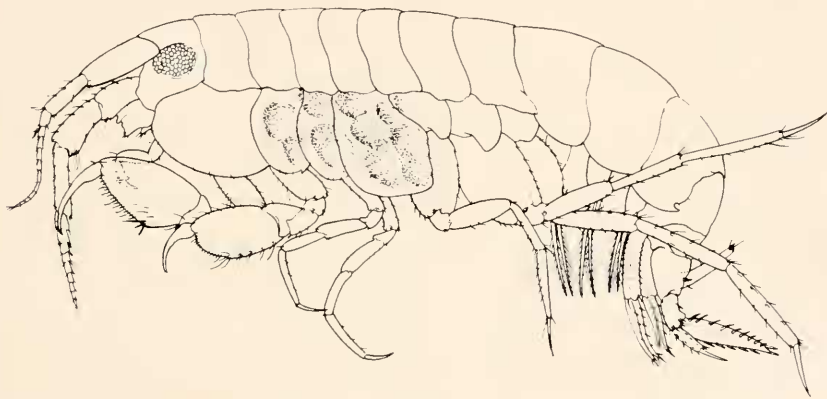


FIGURE 1. *Listriella similis* sp. n., holotype, female, 4.5 mm; Lateral view.

of second segment bluntly produced, distal border convex, with a setule near projection, that of third segment with an upturned dentiform projection followed by a rounded declivity and a setule, the margin above this convex, with a slight notch and a setule at about its middle. Segments 4-6 clearly marked, fourth as long as fifth and sixth combined, sixth distally narrowing and with a small mid-dorsal spine in a shallow depression. Telson twice as long as broad at base, split nearly to $\frac{1}{3}$ of its length, lobes narrow, distally tapering and asymmetrically forked, carrying 2 unequal spines. First coxal plate deeper than corresponding segment, broad and rounded below, second and third shallow, nearly oval, with convex front and lower margins, infero-posterior corners with a small dentiform projection, 4th as broad and deep as first, lower border nearly straight, lateral margins subparallel, hind border with 3 shallow notches, each carrying a setule, upper part excavate. Remaining coxae small and faintly bilobed.

Antennae short; first extending slightly beyond peduncle of second, first segment of peduncle very broad, unarmed and longer than next 2 segments combined, second carrying a few setae on distal and upper margins, third only $\frac{1}{3}$ the

length of second, flagellum shorter than peduncle, 10-segmented and moderately setose. Accessory flagellum as long as first 2 flagellar segments combined and 2-segmented. Antenna 2 more setose, peduncular segments spiny along upper margins, second and third segments of peduncle subequal in length and width, gland cone small, fourth and fifth segments subequal in length, flagellum shorter than peduncle, 9-segmented.

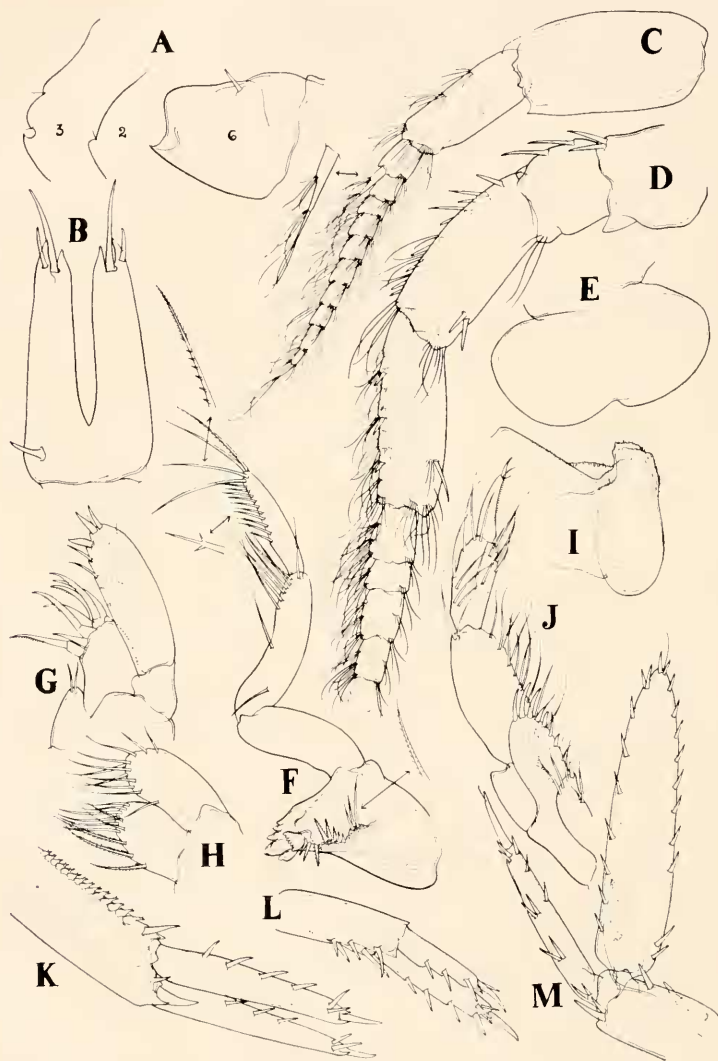


FIGURE 2. *Listriella similis* sp. n. holotype, female, 4.5 mm; A, Pleonal epimera; B, Telson; C, Antenna 1; D, Antenna 2; E, Upper lip; F, Mandible; G, Maxilla 1; H, Maxilla 2; I, Lower lip; J, Maxilliped; K, Uropod 1; L, Uropod 2; M, Uropod 3.

Upper lip with bilobed distal margin. Incisor process of mandible well chitinized and 5-dentate, lacinia mobilis feeble, cut into several teeth, spine row of 8 short spines, some of them faintly barbed, molar degenerate, represented by a slight prominence carrying 3 pectinate setae. Palp well developed and geniculate between segments 1 and 2, first and third segments subequal in length, former stout and unarmed, second longer and armed with a row of spine-setae on inner distal half, third segment slender, distal $\frac{2}{3}$ of its inner margin carrying a row of short spines, apex armed with 4 long, barbed spine-setae. Inner lobe of 1st maxilla small, conical and armed with 2 short apical setae, outer lobe with 7 well developed pectinate spines, first segment of palp $\frac{1}{3}$ length of second, latter oblong, distally broader and armed with 3 apical spines and a few short spine-setae. Inner lobe of second maxilla slightly wider than outer, but shorter, both apically rounded and armed with setae. Lower lip without inner lobes, outer lobes short and widely separated, distally almost rounded and hairy, with a small inner prominence. Mandibular processes short and rounded. Inner lobe of maxilliped small, armed with a strong spine on inner distal angle, inner border straight. Outer lobe reaching beyond distal margin of first endopod segment, rounded distal and inner borders carrying 7 graduated spines, endopod pediform, first segment $\frac{1}{2}$ length of second, second oblong and armed with a row of long setae, third segment $\frac{1}{3}$ shorter than second, but subequal in length to fourth, pectinate along inner margin and ending in a short pointed nail.

Gnathopods nearly subequal in size; basis of first stout, slightly shorter than propodus, distally narrower, margins armed with long slender setae, ischium almost squarish, as long as merus and armed with a few spine-setae, carpus very small and cup-shaped, propodus oval, naked outer border more than twice the length of inner, latter hirsute, palm oblique, twice the length of inner margin, defined by a group of 3 or 4 spines, palmar border slightly convex and closely armed with short spines interspersed with longer ones. Dactylus long, curved, as long as palm, carrying a few very small setules along inner margin. Basis of second gnathopod nearly of uniform width and more setose, ischium subequal to merus in length, merus rectangular, carpus cup-shaped, much longer than in first gnathopod, shorter inner margin forming a small projecting lobe and armed with a group of setae, propodus oblong, inner margin $\frac{1}{3}$ shorter than outer, both armed with long, spine-setae, in a row on the outer and in fascicles on the inner, palm oblique, convex, defined by a group of spines, nearly as long as inner border and armed as in first gnathopod.

Peraeopods 1 and 2 slender and subsimilar, second slightly larger, basis narrow, subequal in length to next 3 segments combined, sides parallel, ischium small, merus and carpus subequal in length, former slightly broader, propodus very narrow, $\frac{1}{4}$ longer than carpus, dactylus nearly as long as carpus, pointed and slightly falcate. Both appendages sparsely setose. Basis of peraeopods 3 and 4 longer than merus, merus about as long as carpus or propodus, outer margin distally armed with a row of strong spines, inner crenate and distally expanding, ischium very small, merus oblong, margins with a few spines, carpus and propodus slender, former with a row of spines on outer border and apices, latter unarmed on inner margin, outer carrying a row of rather long, slender setae. Dactylus nearly straight, pointed and $\frac{1}{2}$ as long as propodus. Basis of peraeopod 5 as long as propodus and

armed as in peraeopod 4, ischium small, merus shorter and both armed with marginal spines. Propodus slender and spiny, dactylus straight, $\frac{1}{2}$ as long as propodus.

Uropods 1 and 2 reaching equally far back; peduncle of 1st as long as the subequal rami, upper margin with a row of tooth-like spines and outer apex

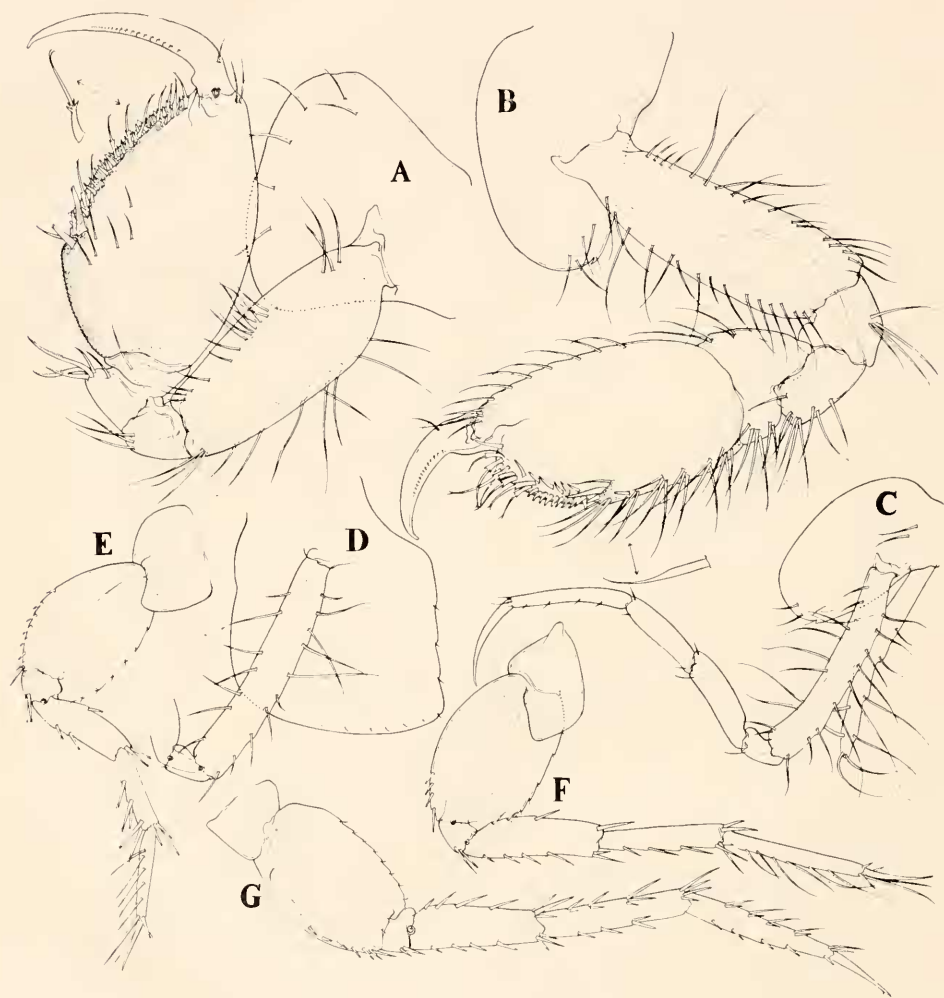


FIGURE 3. *Listricella similis* sp. n., holotype, female, 4.5 mm; A, Gnathopod 1; B, Gnathopod 2; C, Peraeopod 1; D, Peraeopod 2 (articles 2 & 3 with coxa); E, Peraeopod 3; F, Peraeopod 4; G, Peraeopod 5.

carrying a stout spine. Rami apically bidentate and moderately spiny. Uropod 2 shorter than 1st, peduncle as long as longer inner ramus, peduncle and rami spiny. 3rd uropod extending far beyond others, peduncle $\frac{1}{2}$ as long as inner ramus,

latter broad and spiny along both margins. Outer ramus much narrower, slightly more than $\frac{1}{2}$ as long as inner ramus, latter broad and spiny along both margins. Outer ramus much narrower, slightly more than $\frac{1}{2}$ the length of inner and with an apical spiniform segment, less than $\frac{1}{2}$ length of basal segment.

DISCUSSION

In the revised diagnosis provided by J. L. Barnard (1959, page 13) for the family Liljeborgiidae, he mentions among other characters the presence of an elongated first article for the mandibular palp; the geniculation of the mandibular palp between segments 1 and 2 and a telson split right down to its base, as characteristic of the family. Of these, the first two are cited as 'critical points' for the final determination of the members of the family. But subsequently he described a new species *Liljeborgia cota* (J. L. Barnard, 1962, page 83, Fig. 8) in which the palp is not geniculate between segments 1 and 2 and the telson is split only to a third of its length, which is the case in *L. fissicornis* (M. Sars) (see G. O. Sars, 1895, pl. 189) also. Two other liljeborgiids viz. *L. marcinabrio* J. L. Barnard (1969, Fig. 24) and *L. hecia* J. L. Barnard (1970, Fig. 140) also have non-geniculate mandibular palps. Further, the first article of the mandibular palp is not always elongated in all the members of this family (e.g., *L. cota*, *L. marcinabrio* and *L. hecia*). Thus, it would appear that these three characters cannot go together as diagnostic features of the family.

According to J. L. Barnard (1959), family Liljeborgiidae contains only three genera viz. *Idunella* Sars; *Liljeborgia* Bate and *Listriella* J. L. Barnard. Of these, *Idunella* can be easily distinguished from the other two by the presence of large first gnathopods (larger than second). The distinction between the remaining two genera rests mainly on the structure of the 5th article of the gnathopods since, the biarticulate condition of the outer ramus of uropod 3 mentioned by J. L. Barnard in his key (1959, page 14) is subject to variation as the author himself admits on page 16. To add to this we may also consider the biarticulate nature of the accessory flagellum as a distinctive feature of *Listriella*, whereas it is multi-segmented in *Liljeborgia*. Variations in the nature of the accessory flagellum are not unknown among members of the families of suborder Gammaridea (e.g., Isaeidae—including Photidae) and discovery of additional species of both genera may invalidate this character. But, at present this appears to be a very useful difference.

From the females of the hitherto described species of this genus, *Listriella similis* sp. nov. can be distinguished by the following characters: Postero-lateral angle of pleon segment 2 is bluntly produced and the projection is followed by a shallow incision lodging a setule. Pleon segment 3 is very characteristic, the postero-inferior angle is produced into a strong, apically acute hook, followed by a nearly circular incision lodging a setule and further up there is a shallow depression lodging another setule. In this character the present species shows closest resemblance to *L. picta* (Norman) (see Chevreux and Fage, 1925). These two species generally agree in the structure of the mouth parts also. The 6th segment of the first gnathopod in *L. similis* has a nearly straight, prominently spiny palm defined by two strong spines and the segment steadily narrows towards the finger hinge. The only other species which shows a similar palm is *L. diffusa*

J. L. Barnard (1959). Both these agree to some extent in the shape of the 3rd pleon segment also, but they differ in the shape of the 6th segment of the 2nd gnathopod. In this character my specimen shows some affinity to *L. eriopisa* J. L. Barnard (1959), but the latter can be distinguished by the very short outer ramus of uropod 3.

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Through letters, the author has been aided by Dr. J. L. Barnard, Curator, Smithsonian Institution Washington, in certain matters relating to the taxonomy. I thank him most cordially.

SUMMARY AND CONCLUSIONS

A new gammaridean amphipod, *Listriella similis* is described in detail. This species shows resemblance to *L. picta* (Norman), *L. diffusa* J. L. Barnard and *L. eriopisa* J. L. Barnard, but can be easily distinguished by the shape of the third pleon epimeron and the appearance of the sixth segment of gnathopods 1 and 2.

In the light of the present study, the observations of J. L. Barnard (1959) on the family Liljeborgiidae are critically examined. It is found that the three characters mentioned by him for distinguishing the three existing genera of the family, do not go together. Further, it is suggested that the 2-segmented accessory flagellum of antenna 1 in *Listriella* may serve as an additional character, differentiating it from *Liljeborgia*.

A brief summary of the annual sequence in the salinity fluctuations of the Kayamkulam lake, where from the present species was obtained, is given. It is probable that the association of the animal with the algal communities of the bar mouth region of the lake affords some protection to it in the intertidal.

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